Air Conditioner
ACAC-1800BTU H Ex Proof

Explosion Proof Rating ATEX Zone 2 T5
Protected against dust and water to IP55

Part number 8700002

User Manual

Part no. 900308-002 May 2015

INHECO Industrial Heating and Cooling GmbH reserves the right to modify their products for quality improvement. Please note that such modifications may not be documented in this manual.

This manual and the information herein have been assembled with due diligence. **INHECO GmbH** does not assume liability for any misprints or cases of damage resulting from misprints in this manual. If there are any uncertainties, please feel free to contact sales@inheco.com. → How to contact INHECO, page 4.

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Table 1: Version Management

VERSION NO	RELEASE DATE	CHANGES TO PRIOR VERSION
1.0	March 2004	Release
1.1	April 2004	Appendix: CE Certificate
1.2	April 2004	Changed Pictures on Page 1, 13, 22
1.3	June 2004	Changed operating voltage of max. 132 Vdc
001	July 2012	- Use for intended purpose added - Note on stability of the switch cabinet wall - Torque for installation specified - Each of the fans requires an electrical fuse - Technical data: higher ambient temperature - Technical data: ambient side satisfies IP55 - Circuit diagram: fuse added - Name plate added - EC Declaration of Conformity - Certificate deleted
002	May 2015	- Explanation of symbols: symbols changed - Technical data cabinet fan

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This manual belongs to

Type _____

Serial # _____

Year of manufacture _____

Order # _____

To be filled in by customer:

Inventory No. _____

Place of installation _____

About this manual

This manual is part of the Air Conditioner Heater ACAC-180-W Ex Proof and must be

- retained until the Air Conditioner Heater is disposed of.
- passed on when the Air Conditioner Heater is sold or lent.

Contact INHECO in case there are any uncertainties of how to operate or how to handle the Aid Conditioner.

Your opinion about this manual provides us with valuable insights on how we can improve this document. Please do not hesitate to send your comments to us at the address or the phone numbers on page 4.

The safety instructions must be read very carefully. They must be understood and observed in order to ensure safe working.

Lack of knowledge or insufficient knowledge of the manual will invalidate claims against INHECO GmbH. The operator should therefore ask for confirmation from the manufacturer that instruction has been given.

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1 Explanation of symbols

A high possible danger, leading to serious bodily harm or even death is being pointed out to you.

A possible danger, leading to serious bodily harm or even death is being pointed out to you.

A possible danger leading to less serious bodily harm is being pointed out to you.

A possible dangerous situation leading to material damage is being pointed out to you.

Important!

This sign refers to useful information as to installation etc.

Note

- Bullet points refer to enumeration.

⇒ These arrows are intended to give instructions.

■ These squares refer to procedures which run automatically and results which should be achieved.

2 Safety Instructions

2.1 Conventional usage

The AIR CONDITIONER HEATER units are state-of-the-art devices and complies with today's standards. The manufacturer attaches great importance to the user's safety.

The following rules apply to the user:

- Rules of accident prevention
- General rules for technical safety
- EU and other national directives

Conventional usage include usage as listed in this manual. This unit is to be used only in the specified environment.

2.2 Who is permitted to operate this unit?

Only trained skilled personnel are permitted to install and operate this unit.

2.3 Decommissioning and disposal

The unit must be disposed of according to the applicable environmental directives.

3 For your Own Safety

Disconnect the unit from any power supply system when installing it. By doing so accidents can be avoided.

3.1 Technical modifications

- For reasons of safety, no technical modifications to this unit are allowed. Any modification or change which is not approved by the manufacturer will invalidate the warranty.
- The original parts are designed especially for the AIR CONDITIONER HEATER. Parts provided by other suppliers have not been tested and are therefore not approved by INHECO GmbH. Using them can lead to impairment of the functionality of the unit.
- INHECO GmbH accepts no liability for damage which may occur due to the use of parts other than original parts.

3.2 Malfunctions

⇒ If any malfunction occurs, report it immediately to the responsible person.
⇒ Make sure the unit is secured against vandalism and misuse.
⇒ If any safety-relevant parts are removed, they must be reinstalled and checked before restarting operation.

3.3 Name plate and labels

⇒ Please check all name plates and labels and ensure they remain legible.

⇒ Replace any name plates and labels that are no longer legible.

4 Other Hazards

4.1 Electric shock hazard

If the unit is not connected properly or if the unit is not disconnected from the power supply when working with the cabinet open or during installation, you may suffer an electric shock.

Please observe the following measures in order to avoid muscle convulsions, burns, unconsciousness, cessation of breathing and even death:

- ⇒ Do not work on the unit with the cabinet open when it is connected to the power supply.
- ⇒ The unit is operated at a voltage of up to 125V DC and takes a current of up to 12 A DC.

4.2 Burn hazard

You may burn your skin when touching the heat sinks of the AIR CONDITIONER HEATER. These heat sinks can reach temperatures up to 75°C!

The heat sink cools down only slowly after the unit has been switched off.

4.3 Risk of injury

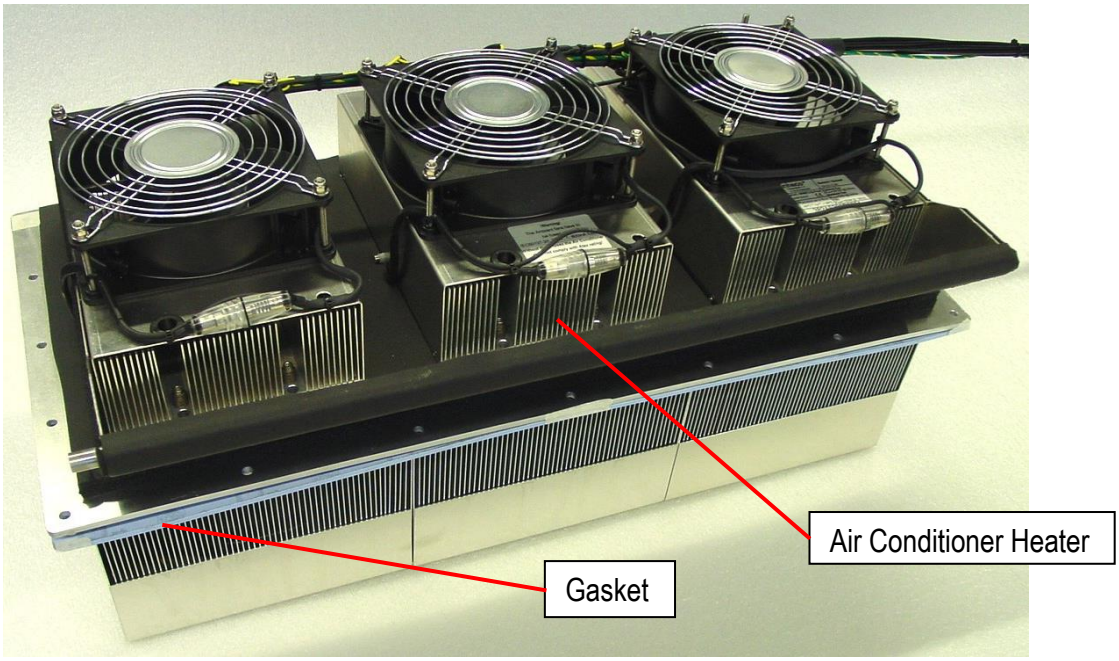
You may injure yourself if you touch the impeller by hand when it is running. You may also be injured if you move items you are holding into the sweep of the impeller when it is running. Do not remove the finger guard until the power has been switched off.

5 Initial Operation

5.1 Scope of supply

Before commissioning, check that the device was delivered complete and undamaged. The following components are included in the scope of supply:

- Air Conditioner Heater incl. gasket
- Handling instruction
- This Manual



Picture 1: Scope of supply

5.2 Use for the intended purpose

The Air Conditioner Heater is intended for heating and cooling of switch cabinets which are located in zone 2 potentially explosive atmospheres in accordance with Directive 94/9EC. The switch cabinet may be installed either in a protected environment or in the open air. A precondition for the use of the Air Conditioner Heater in Zone 2 is that the switch cabinet satisfies at least the requirements of Index of Protection IP54 and is also approved for Ex zone 2. When correctly installed the gasket supplied with the Air Conditioner Heater offers IP55 protection. Correct installation is described on the following pages.

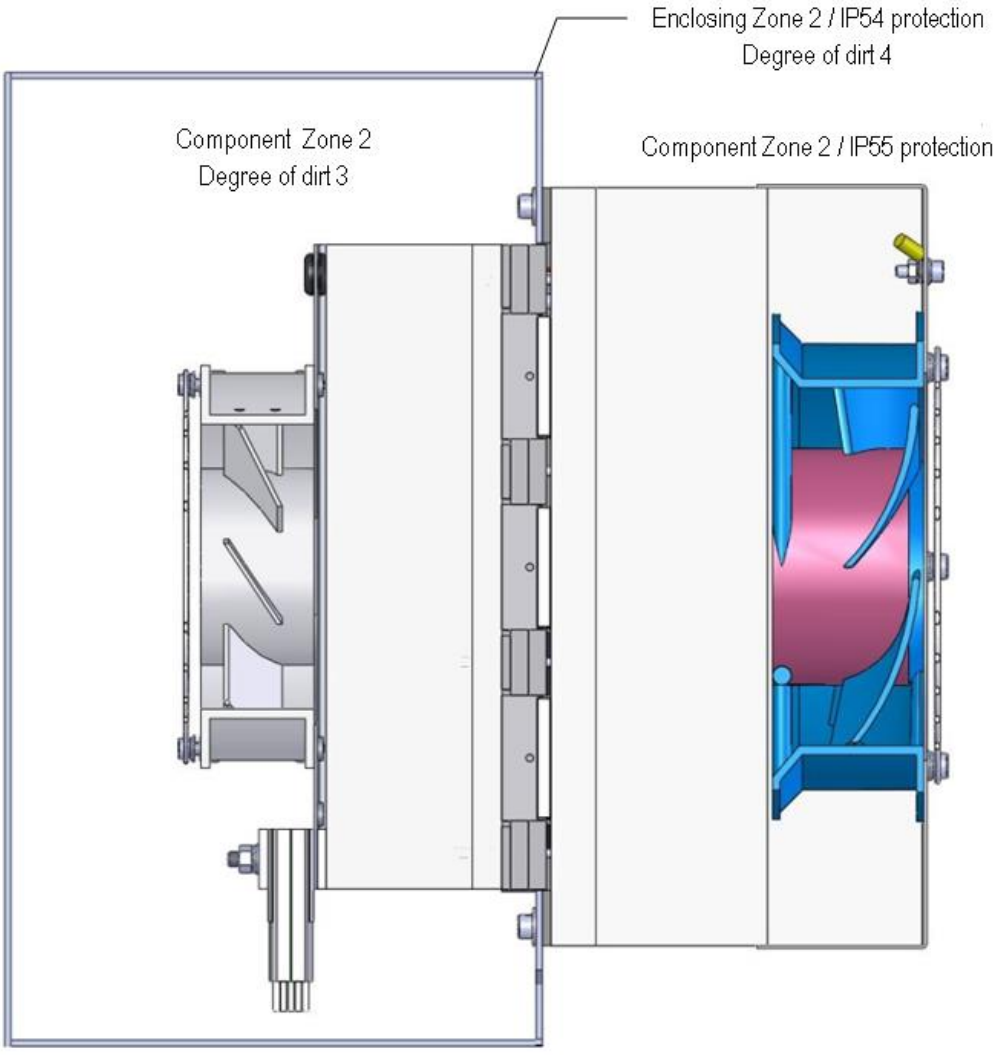


Figure 1 (sectional view): there is no air flow between the module and the inside and outside of the switch cabinet. The cabinet with IP54 protection is not part of the module and is provided by the operator. The appropriate degree of dirt on the module side is stated in DIN IEC 60664-1.

6 Installation

The unit may be installed only by appropriately trained personnel! Use only the correct tools for all types and sizes of screws.

Important!

Make sure that all air inlets and air outlets on both the ambient and cabinet sides are open so that air can circulate without obstruction. Check whether the distance between the inlets and all walls are minimum 50mm at the ambient side and 40mm at the cabinet side.

Check also that the air flow that exits the heat sink does not strike the wall of the cabinet, since otherwise turbulence will occur which may affect the reliability of operation. Use flow channels or air shields to direct the air flow to areas where it is needed.

If the flow channels and shield plates for the unit at the installation location does not comply with the required minimum distances, the heating and cooling performance of the unit cannot be guaranteed.

Each fan must be protected by an electrical fuse in accordance with the standard IEC 60127-2 as to limit the maximum current, see section 12. Terminal diagram or the circuit diagram. When the fuse is fitted within the zone 2, its installation must satisfy section 9 of EN 60079-15.

Ensure that the Air Conditioner Heater is operated only when this fuse is in proper condition. Never operate the Air Conditioner Heater with a fuse whose rating is different to this.

DANGER !!

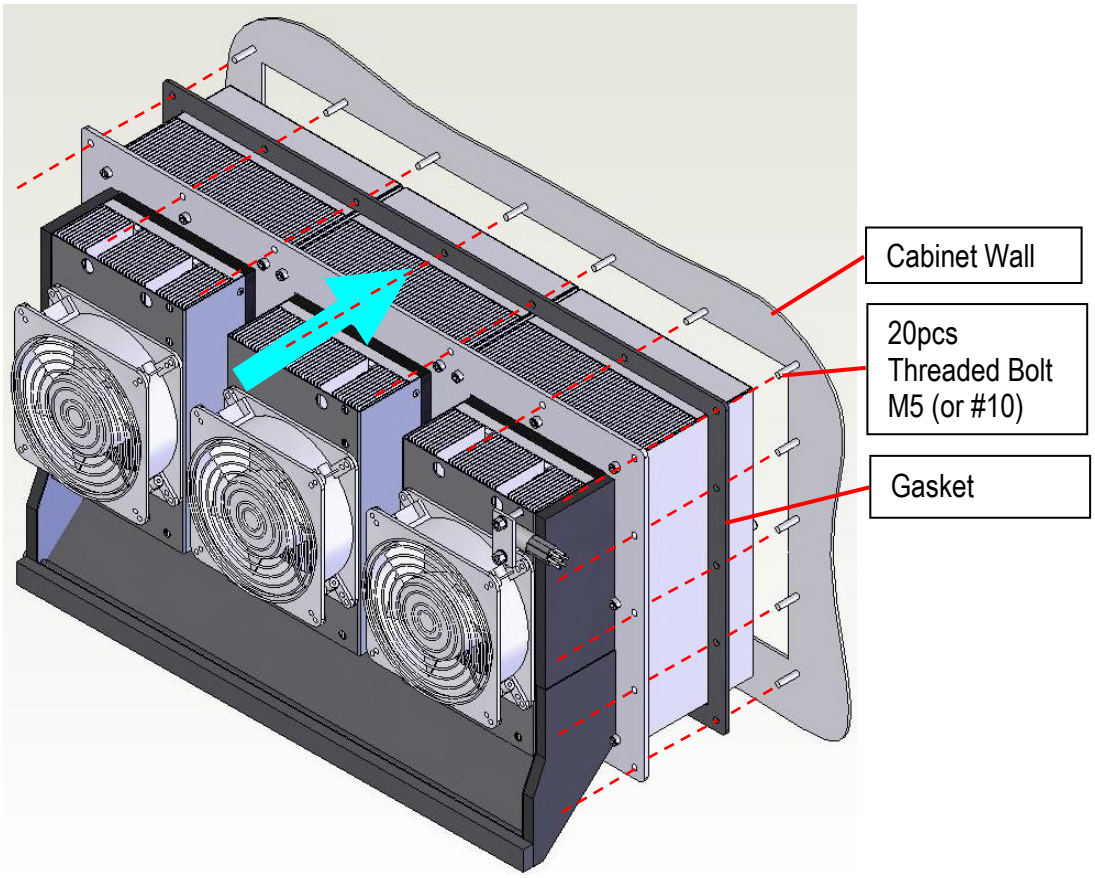
DANGER! If the unit is operated without a fuse or with a fuse whose rating is different to that specified, the Air Conditioner Heater is no longer ATEX certified! In environments which require ATEX certification, do not use the Air Conditioner Heater without a fuse or with a fuse whose rating is different to that specified!

The unit must be provided with a device for suppression of transient surges. The device for suppression of transient surges must reduce surges to a maximum of 140% (33.6 V DC) of the operating voltage.

DANGER !!

DANGER! If the overvoltage is higher than +40%, the Air Conditioner Heater no longer complies with the ATEX rating!

Installation procedure:



Picture 2: Mounting of the AIR CONDITIONER HEATER from inside the cabinet

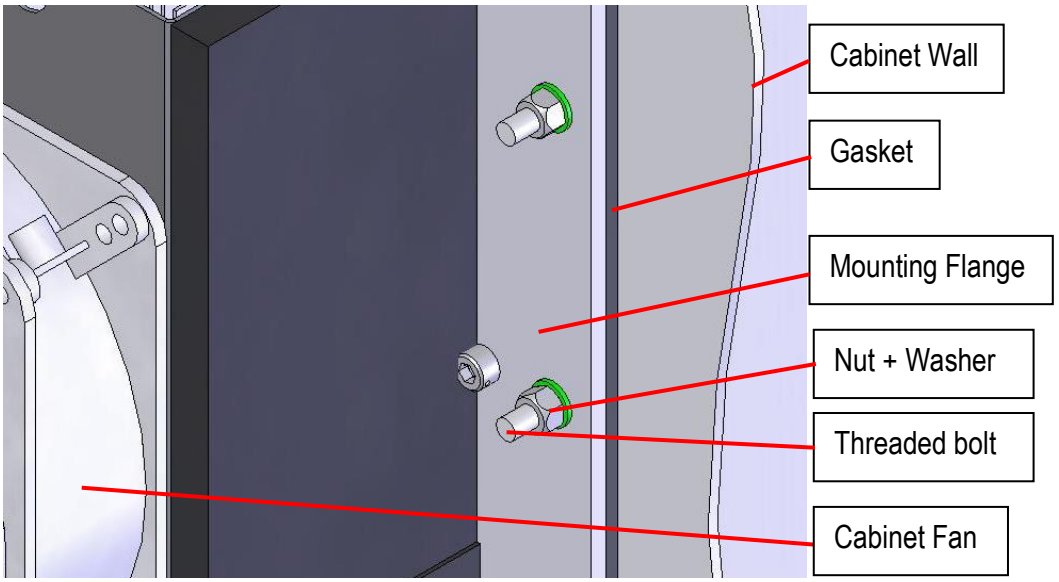
⇒ The cabinet wall must have 20 pcs threaded bolts M5 (or #10) for mounting the Air Conditioner. The Air Conditioner is mounted from inside of the cabinet.

⇒ The Drip Pan should be mounted after the Air Conditioner is fixed to the cabinet wall.

⇒ Check whether the area for the gasket around the cutout in the cabinet wall is properly finished and free from any dirt, dust or any other materials. Recommended surface roughness Rt = 50 – 160µm.

⇒ Place the gasket inside the cabinet wall by using the ends of the 20 pcs M5 (or #10) threaded bolts to position the gasket. Check the fit and position of the gasket. Both sides of the gasket and opposite surface of the mounting frame must be clean, flat, undamaged and free from grease or separator.

⇒ Take the Air Conditioner (the Air Conditioner weighs about 30.0 kg) and hold it in upright position, and fit in the cabinet side of the Air Conditioner through the cut out in the cabinet wall. Fix it with 20 pcs M5 (or #10) nuts and washers. The nuts should be tightened crosswise in three rounds to assure a proper press fit of the gasket. During the first round apply 50% of the torque, during the second round 80% and during the third round apply the full torque. The torque should be 4.2Nm, to ensure the gasket functions correctly. Please check, whether the applied torque does not damage the screw thread. Make sure that the cabinet wall is tightly sealed against the gasket and is not deformed. Check the torque 24 hours after mounting.



Picture 3: Mounting of the AIR CONDITIONER HEATER

⇒ Check visually, that the gasket between the ambient side heat sink base and the cabinet fits properly and is not damaged.

⇒ Switch off all electricity power for the cabinet.

⇒ Connect the 9 leads to the power supply (controller) inside of the cabinet as specified, see also the *Wiring scheme* in chapter *12*. **The sensor loop must be connected and detected. Otherwise the Air Conditioner does not comply with ATEX rating! The sensor loop detects over temperature at the surfaces of the Air Conditioner.**

⇒ In case of a malfunction the overvoltage must be limited to max. +5.6% of the value shown in the chapter Technical Data. **DANGER! If the Overvoltage is higher than +5.6%, the Air Conditioner does not comply with ATEX rating!**

7 Dismounting

The unit may be installed or reinstalled only by **appropriately trained personnel!**
Use only the correct tools for all screws.

⇒ **Shut down the main power** for the AIR CONDITIONER HEATER.

⇒ Disconnect the 9 leads to the power supply (Controller) inside of the cabinet as specified in the corresponding manual, (see page 19).

⇒ Dismantle the 20 pcs M5 (or #10) nuts and washers. Be careful to prevent the unit from falling down, as there are no additional safeguards, when the screws are removed.

⇒ Take out the unit through the cutout of the cabinet wall.

⇒ If necessary take off the gasket from the base of the ambient side heat sink or the cabinet wall.

⇒ Before mounting the unit again, check the screws, the screw threads and the gasket for damages.

DANGER! Do not use damaged or not original parts for mounting the unit!
DANGER! When screws or / and the gasket are damaged, the Air Conditioner does not comply with ATEX rating ! Do not use the Air Conditioner with damaged screws or gasket in environments, which require ATEX certificates!

⇒ Replace damaged parts according the replacement parts list.

8 Initial Operation

Note

For the exact specifications of the Temperature Controller for the Air Conditioner please refer to the corresponding manual.
Please check: the temperature controller must ensure that even during the worst case the voltage does not exceed 5.6% of the specified maximum nominal voltage. The controller is not included in the Air Conditioner package and for this reason the device is marked with the symbol “X” accordingly to the ATEX standard EN 60075-15 section 13c.

⇒ Turn on the power for the AIR CONDITIONER HEATER.

⇒ Check the proper operation of the ambient side fan. When connected correctly the air flows through the fan and exits from both ends of the ambient side heat sink.

⇒ Check the correct operation of the cabinet side fan. When connected correctly the air flows through the fan and exits from both ends of the cabinet side heat sink.

⇒ **To avoid malfunction of the Air Conditioner, all 6 fans have to work in the cooling mode.**

⇒ **To avoid malfunction of the Air Conditioner, the cabinet fans have to work in the heating mode.**

⇒ Check the operation of the heating or cooling function: In **cooling mode**, the heat sinks inside of the cabinet are cold, the heat sinks outside the cabinet are hot. In **heating mode**, the heat sinks inside of the cabinet are hot, the heat sinks outside the cabinet are cold.

⇒ **To avoid malfunction of the Air Conditioner in the heating mode, the cabinet temperature must be below +20°C! The cabinet temperature must be controlled by the user to avoid malfunction of the unit.**

⇒ **At +75°C +/-5°C (+167 °F) heat sink temperature the Air Conditioner must shut off. The AC is equipped with thermal fuses on all heatsinks. If one heat sink is too hot, an open loop will be detected. The user has to make sure, that the AC is shut off immediately after an open loop (temperature above +75°C +/-5K was detected).**

To start up 1st time or restart during ambient temperature conditions below +4 °C (+40 °F):

⇒ Cabinet side fan has to be warmed up above +20°C (+68 °F). Ensure this temperature with a short run in the heating mode before switching on or connection to electricity power. Otherwise damage cannot be excluded.

DANGER! Do not run the unit without testing the proper function of the heating / cooling mode and the proper function of the open loop detection for the ambient and cabinet side temperature. Otherwise overheating and damage of the unit and surrounding equipment can occur! When the heating and cooling mode and the ambient and cabinet side temperature sensors do not work properly, the Air Conditioner does not comply with ATEX rating! Do not use the Air Conditioner without proper function of the heating and cooling mode and proper function of ambient and cabinet side temperature sensors in environments, which require ATEX certificates!

9 Safety instructions for operation

To avoid injuries and damage, an unimpeded air supply must be ensured at both heat sinks. To prevent damage to the AIR CONDITIONER HEATER, the specified ambient temperature must not be exceeded (see 11.1).

Lift the unit carefully. To prevent damage to the thermoelectric modules, avoid side loads or pressure on the heat sinks.

Use the unit only within the specified range of DC voltage and current (see 11.1). The unit operates only on DC and not on AC.

DANGER! If the unit is connected to a power supply other than the specified DC voltage, the Air Conditioner Heater is no longer ATEX certified! In environments which require ATEX certification, do not use the Air Conditioner Heater connected to a power supply other than the specified DC voltage!

DANGER! To avoid injuries by electric shock, disconnect the unit from the power supply system before any work on the unit. Only trained personnel are permitted to install and deinstall the unit.

Possible malfunctions of the Air Conditioner are:

- ⇒ Failure of the ambient side fans
- ⇒ Failure of the cabinet side fans
- ⇒ Failure of the temperature controller
- ⇒ Failure of the power supply
- ⇒ Operation above the specified ambient temperature condition

All these malfunctions can lead to increased temperatures at the Air Conditioner especially at the ambient side. These increased temperatures can damage parts of the Air Conditioner.

DANGER! When the Air Conditioner or parts of the Air Conditioner are operated at temperatures higher than specified, the Air Conditioner does not comply with ATEX rating! Do not use the Air Conditioner, after it has been operating under temperatures higher than specified, in environments, which require ATEX certificates!

10 Service Instructions

10.1 Cleaning

Regularly check that the fans and the heat sinks on the ambient and the cabinet side are free from dust and dirt. If necessary blow out the fans and heat sinks with compressed air. Take care that the compressed air does not damage the impeller bearing! Also check the leak-tightness of the gasket and check that all screws are tightened to the correct torque.

10.2 Full Service

Provided the AIR CONDITIONER HEATER is operated within the specified ambient conditions, a FULL SERVICE of the unit is recommended after 5 years of operation (43,500 hours). The FULL SERVICE of the AIR CONDITIONER HEATER must be performed by INHECO GmbH or by authorized partners from INHECO GmbH.

DANGER! If after 5 years of operation the unit has not been given a FULL SERVICE by an authorized person, the Air Conditioner Heater may no longer conform to ATEX certification! In environments which require ATEX certification, do not use the Air Conditioner Heater after 5 years (43,500 hours) of operation unless the unit has been given a FULL SERVICE!

Please contact us for further information on authorized partners of INHECO GmbH.

10.3 Fuse

Each fan must be protected by an electrical fuse in accordance with the standard IEC 60127-2 as to limit the maximum current, see section 12 Terminal diagram or the circuit diagram.

Ensure that the Air Conditioner Heater is operated only when this fuse is in proper condition. Never operate the Air Conditioner Heater with a fuse whose rating is different to this.

DANGER! If the unit is operated without a fuse or with a fuse whose rating is different to that specified, the Air Conditioner Heater is no longer ATEX certified! In environments which require ATEX certification, do not use the Air Conditioner Heater without a fuse or with a fuse whose rating is different to that specified!

The fuse is part of the Air Conditioner and can be change from inside of the cabinet!

11 Technical Data

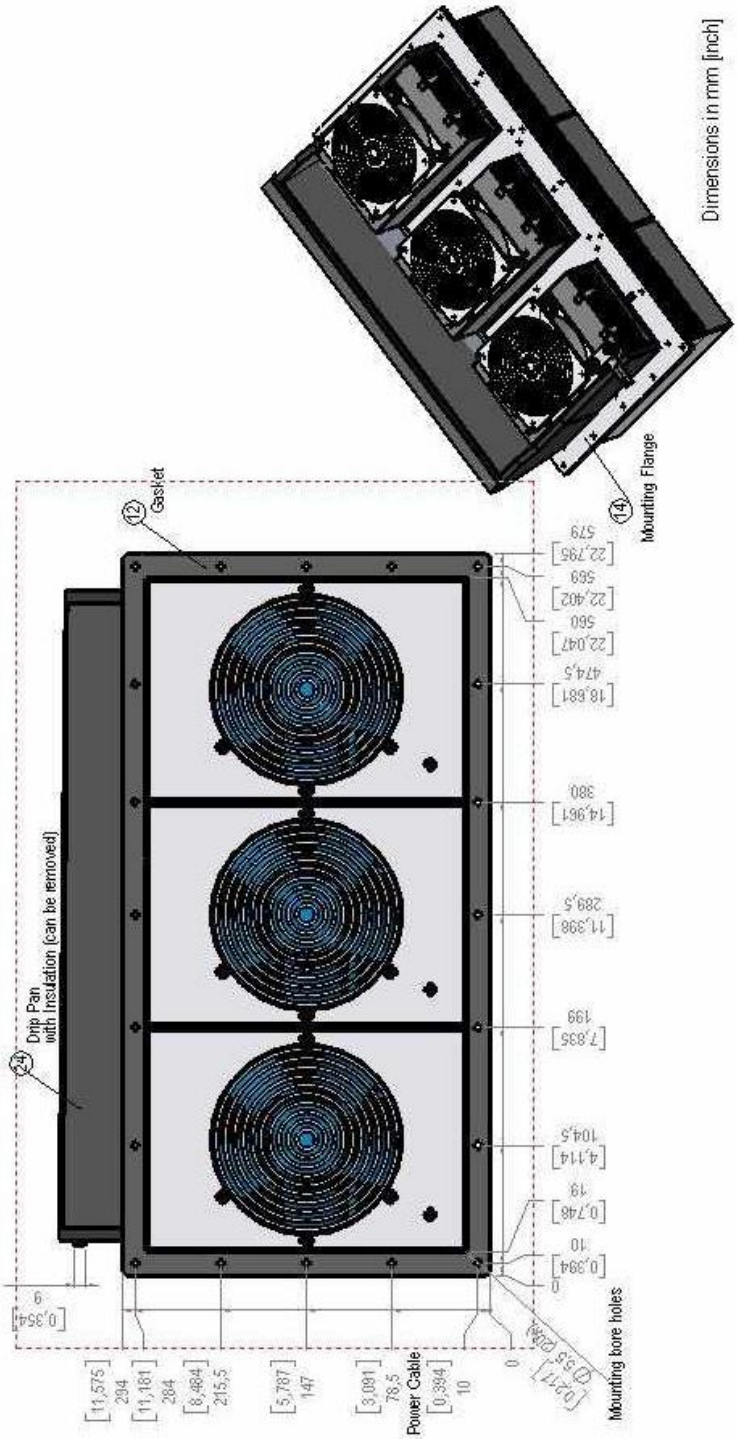
11.1 Technical Data

Table 2: Data of the ACAC-1800BTU H Ex Proof

Max. cooling power at +25°C (+77°F) ambient temperature and delta T = 0K	528W see operating characteristic curves
Operating voltage for TEC	125V DC ±5.6%
Maximum operating current for TEC	12A DC
Maximum power consumption for TEC	1600W
Power supply ambient fans	max. 56W @ 24V DC ±10%
Power supply cabinet fans	max. 35W @ 24V DC ±10%
Maximum ambient temperature*	+55°C (+131°F)
Minimum ambient temperature*	-40°C (-40°F)
Weight	about 30kg (66lb)
Index of protection cabinet fan (internal space)	IP20
Index of protection ambient fan	IP55
Maximum noise level	68.9 dBA
Equipment category	Ⓔx II 3G Ex nA IIA T5 Gc
Overall dimensions H x W x D	265 mm x 579 mm x 294 mm (10.4” x 22.8” x 11.6”)

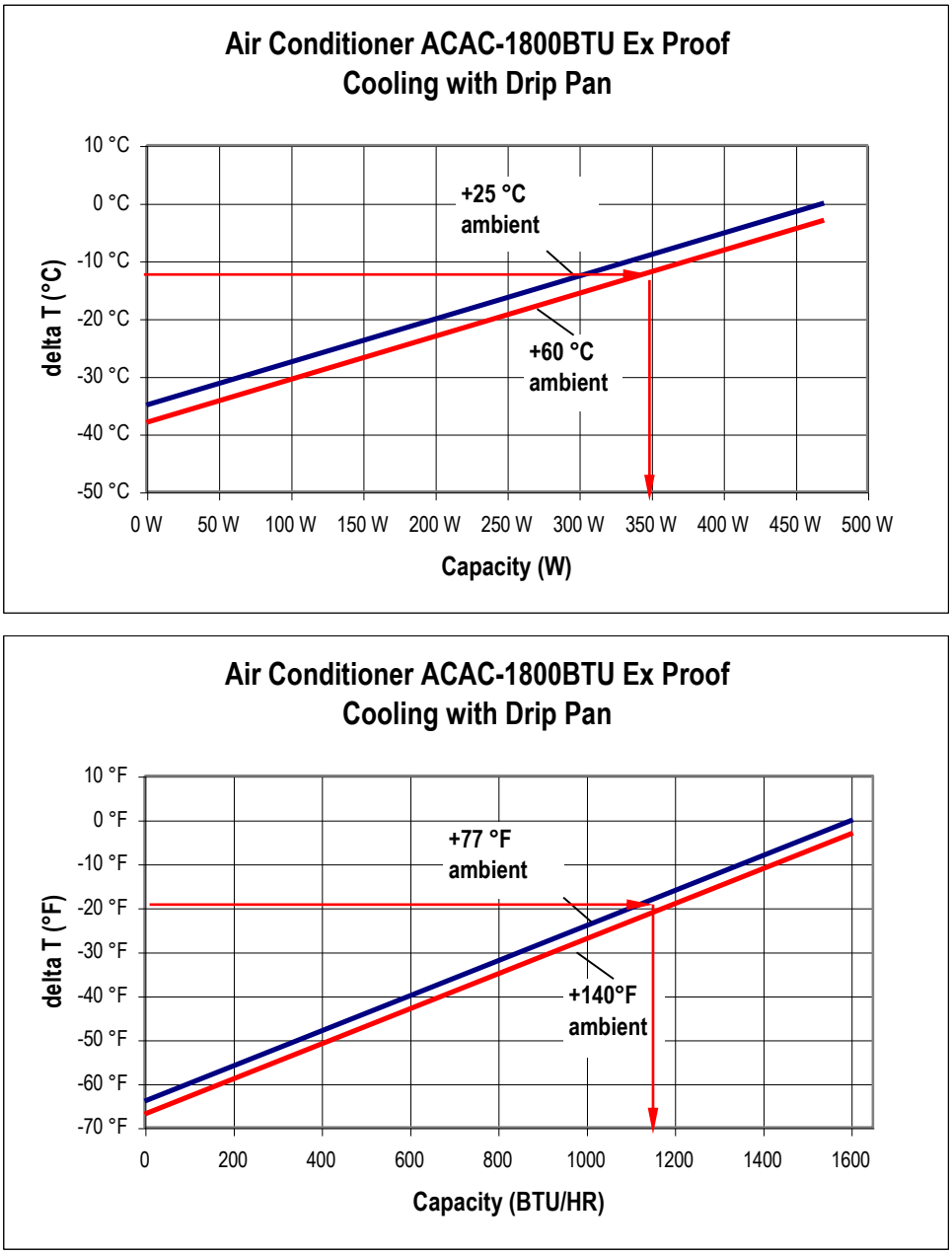
* See Initial Operation on page 11 for more detailed information.

11.2 Dimensional drawing



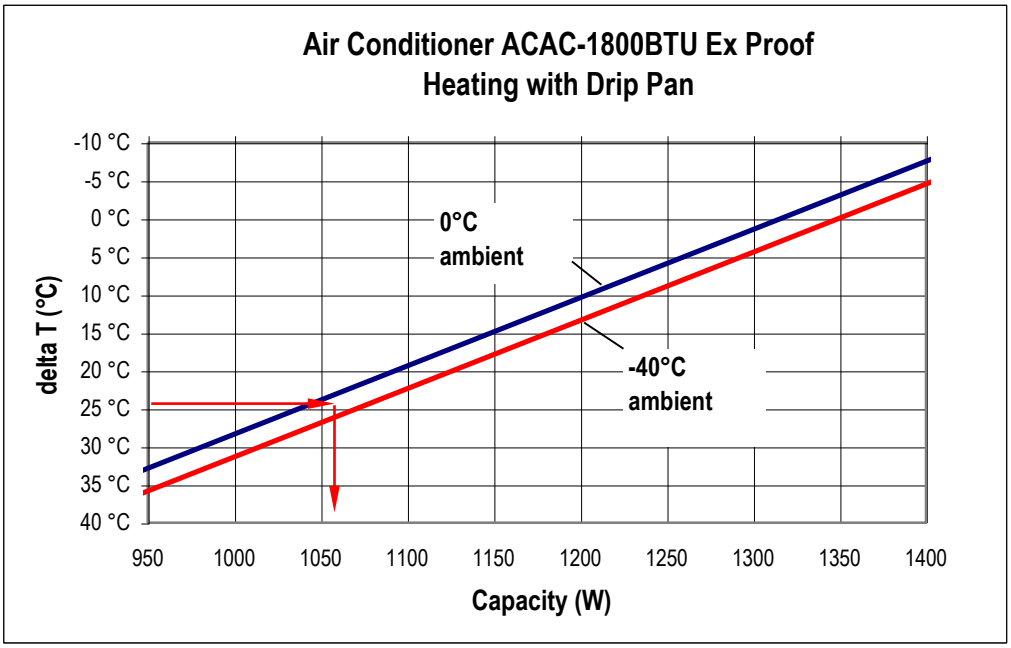
Picture 4: Dimensional Drawings of the Air Conditioner

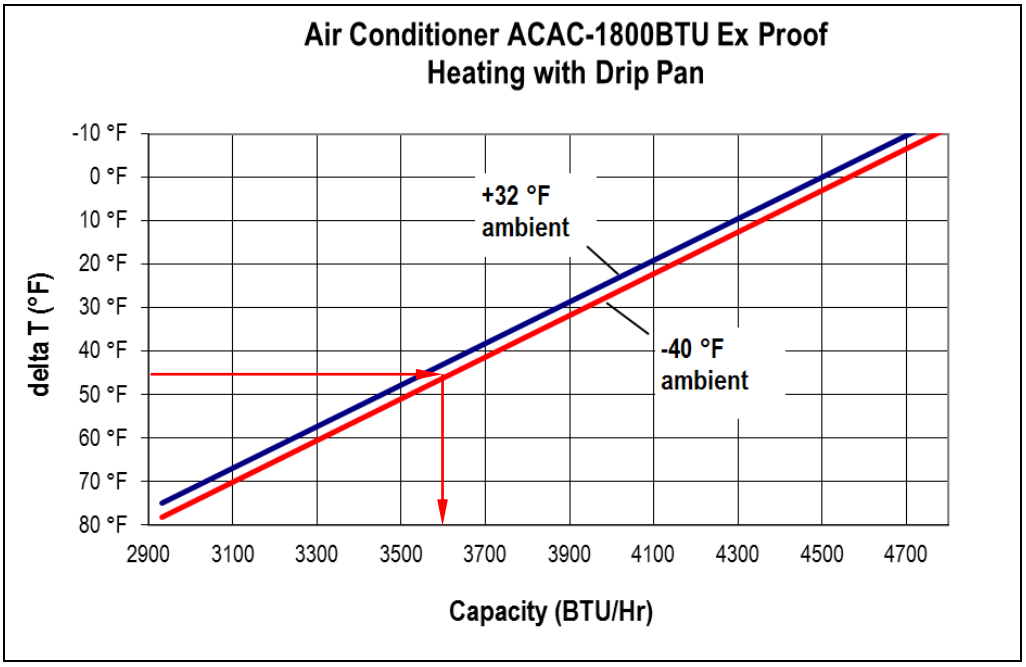
11.3 Operating characteristic curves



Picture 5: Cooling Curves of the Air Conditioner in Metric and US Units at ideal conditions (non condensing)

Example for calculating the <u>cooling</u> capacity of the AC with given temperatures:
Definition: deltaT = $T_{cabinet}$ - $T_{ambient}$
$T_{ambient}$ = +45°C; $T_{cabinet}$ = +35°C calculation: deltaT = 35°C - 45°C = -10°C
$T_{ambient}$ = +113 F; $T_{cabinet}$ = +95°F calculation: deltaT = 95°F - 113°F = -18°F
Cooling Power = ~350 W (~1195 BTU/HR)





Picture 6: Heating Curves of the Air Conditioner in Metric and US Units at ideal conditions (non condensing)

Example for calculating the heating capacity of the AC with given temperatures:

Definition: delta T = $T_{cabinet}$ - $T_{ambient}$

$T_{cabinet}$ = +5°C ; $T_{ambient}$ = -20°C calculation: deltaT = +5°C - (-20°C)= +25°C

$T_{cabinet}$ = +41 F; $T_{ambient}$ = -4°F calculation: deltaT = +41°F-(-4°F)= +45°F

Heating Power = ~1060 W (3620 BTU/HR)

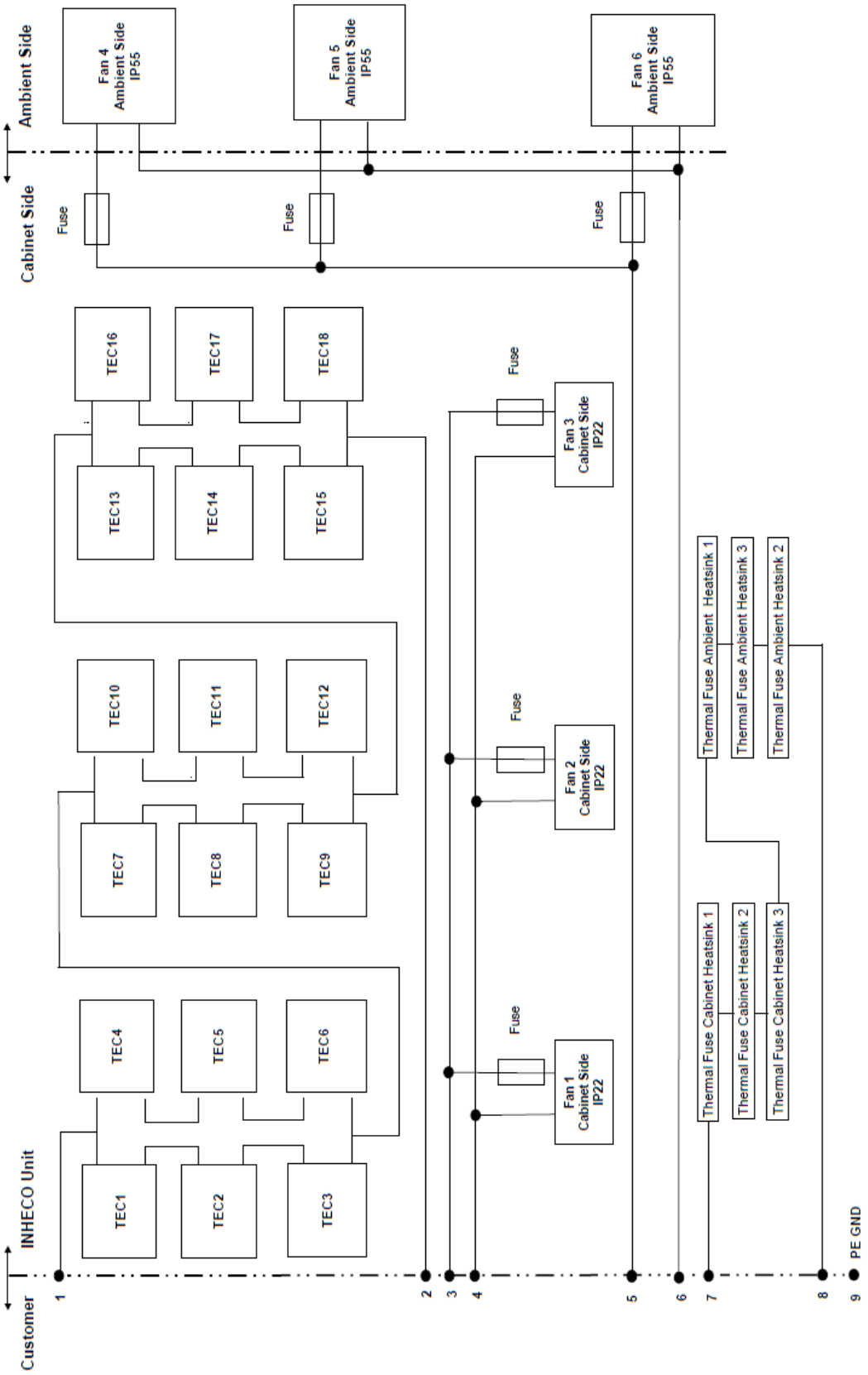
12 Wiring schematic and circuit diagram

Table 3: Wiring of the Air Conditioner

Description	Wire-No.	Power consumption	AWG	Color
TEC +	1	132 Vdc at 1600 W	10 (6 mm²)	Black
TEC -	2		10 (6 mm²)	Black
Fan + (Cabinet)	3	24 Vdc at 35 W	10 (6 mm²)	Black
Fan - (Cabinet)	4		10 (6 mm²)	Black
Fan + (Ambient)	5	24 Vdc at 56 W	10 (6 mm²)	Black
Fan - (Ambient)	6		10 (6 mm²)	Black
Thermal Fuse*	7	open loop detection	14 (2 mm²)	Black
Thermal Fuse*	8		14 (2 mm²)	Black
PE GND	9	-	12 (4 mm²)	GN/YE

*Breaks an electric contact when temperature rises.
Resets automatically when temperature drops.

TEC:	Cooling mode: wiring as shown in Table 3 Heating mode: TEC polarity must be switched
Cable length:	10 foot (3 m)
End of cables:	End splices marked with permanent wire marker tags, heat shrink covered, clear


Ambient Side
Cabinet Side
Fan 4 Ambient Side IP55
Fan 5 Ambient Side IP55
Fan 6 Ambient Side IP55
Fuse
Fuse
Fuse
TEC16
TEC17
TEC18
TEC13
TEC14
TEC15
TEC10
TEC11
TEC12
TEC7
TEC8
TEC9
TEC4
TEC5
TEC6
TEC1
TEC2
TEC3
Fuse
Fuse
Fuse
Fan 3 Cabinet Side IP22
Fan 2 Cabinet Side IP22
Fan 1 Cabinet Side IP22
Thermal Fuse Ambient Heatsink 1
Thermal Fuse Ambient Heatsink 3
Thermal Fuse Ambient Heatsink 2
Thermal Fuse Cabinet Heatsink 1
Thermal Fuse Cabinet Heatsink 2
Thermal Fuse Cabinet Heatsink 3
INHECO Unit
Customer
1
2
3
4
5
6
7
8
9
PE GND

13 EC Declaration of Conformity

on the basis of a voluntary test in accordance with Annex VIII of the Directive 94/9/EC of the council for equipment and protective systems intended for use in areas with potentially explosive atmospheres.

Product:	ACAC-1800BTU H Ex Proof
Model:	8700002
Marking:	Ex II 3G Ex nA IIA T5 Gc
Approval:	EPS 11 ATEX 1 401 X
Manufacturer:	INHECO Industrial Heating and Cooling GmbH 82152 Martinsried Germany

The product mentioned above fulfils the basic requirements of the Directive

94/9/EC	ATEX Directive
2006/95/EC	Low Voltage Directive
2004/108/EC	EMC Directive

and conforms to the following standards

EN 600079-0:2009	Potentially explosive atmospheres - part 0: General requirements for equipment
EN 600079-15:2010	Potentially explosive atmospheres - part 15: Equipment protection by ignition "n"

The product named is intended for incorporation into other equipment. Operation is permitted only once the end product has satisfied the requirements of the Directives listed above.
This statement does not warrant any characteristics regarding product liability.
The safety instructions stated in the User Manual must be adhered to.

Günter Tenzler
Managing Director
May 2015

14 Name plate

Manufacturer		INHECO GmbH, 82152 Martinsried, Germany
Module name	-	ACAC-1800BTU H Ex Proof
Item number INHECO	PN	8700002
Serial number	SN	XXXX
Date of manufacture		YYYY-MM
Equipment group/category	Ratings maintained	Ⓔx II 3G Ex nA IIA T5 Gc
Ambient conditions	Ambient temperatures	-40°C (-40°F) ≤ Ta ≤ +55°C (+131°F)
Max. power consumption	Power supply	TEC P_{i_max} 1600W @ 132V DC Fan Ambient P_i 56W @ 24V DC Fan Cabinet P_i 35W @ 24V DC
CE mark		---
RoHS kite mark		---
CE conformity certificate number	Certificate no.	EPS 11 ATEX 1 401 X